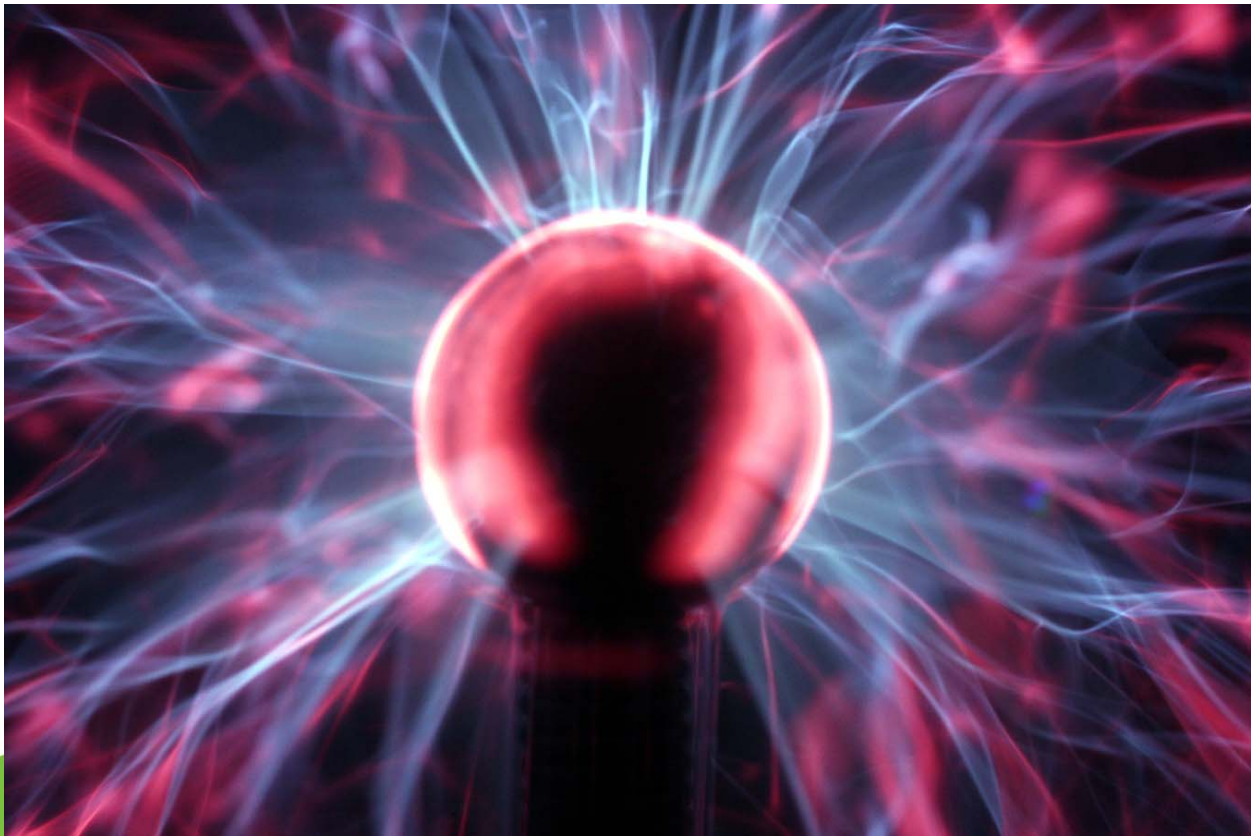


U N D E R G R A D U A T E
STUDENT HANDBOOK



ELECTRICAL & COMPUTER
ENGINEERING DEPARTMENT



O F F E R I N G T H E

Bachelor of Science in Electrical Engineering
Bachelor of Science in Computer Engineering

Revised March 9, 2016

The statements set forth in this Handbook are for informational purposes only and should not be construed as the basis of a contract between a student and this institution. While provisions of this Handbook ordinarily will be applied as stated, ECE reserves the right to change any provision listed in this Handbook without actual notice to individual students. Every effort will be made to keep students advised of any such change. For the most current version of the Student Handbook, please see the online version on the ECE website at: www.ece.unm.edu

ABET ACCREDITATION

ABET PROGRAM EDUCATIONAL OBJECTIVES

The Electrical and Computer Engineering programs are accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>. The Objectives of the UNM ECE undergraduate programs in Electrical and Computer Engineering are to educate students to become resourceful practitioners of engineering who:

1. Are capable of utilizing their engineering skills in industry, nonprofit organizations, and national laboratories, or in the pursuit of graduate education;
2. Are knowledgeable of the professional responsibilities and social context associated with being an engineer; can work in teams and effectively communicate the results of their work;
3. Will develop their knowledge and skills throughout their careers; and,
4. Function well in a diverse environment.

ABET PROGRAM EDUCATIONAL OUTCOMES

The Outcomes of the ECE undergraduate programs in Electrical and Computer Engineering are to educate students who will have:

- an ability to apply knowledge of mathematics, science, and engineering
- an ability to design and conduct experiments, as well as to analyze and interpret data
- an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- an ability to function on multidisciplinary teams
- an ability to identify, formulate, and solve engineering problems
- an understanding of professional and ethical responsibility
- an ability to communicate effectively
- the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- a recognition of the need for, and an ability to engage in life-long learning

ABET ACCREDITATION

UNDERGRADUATE ENROLLMENT

	Fall 2011	Fall 2012	Fall 2013	Fall 2014
Comp E	60	58	71	80
EE	120	109	128	139
ECE Total	180	167	199	219

UNDERGRADUATE GRADUATION

	2010-2011	2011-2012	2012-2013	2013-2014
Comp E	10	13	18	22
EE	28	37	29	34
ECE Total	38	50	47	56

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BACCALAUREATE DEGREE PROGRAM

GOAL OF THE BACCALAUREATE PROGRAMS

The principal goal of the baccalaureate programs in the ECE Department is to provide students with the fundamentals of electrical or computer engineering so that they have an excellent base for a successful engineering career. This includes building a sufficient reading knowledge and analytical capability so that the graduate can continue to expand their knowledge as their field of interest and scope of electrical and computer engineering fields change.

BROAD BASE PROVIDED BY ECE CORE COURSES

ECE's core courses provide a broad base so that those who complete their formal education with the bachelor's degree can continue to learn and expand their skills. Likewise, the base provides insight into fields that students may choose to study at the graduate level. This goal is met by a curriculum in which there is a progression in course work, and in which fundamental knowledge of earlier years is applied in later engineering courses.

DESIGN IS THE HEART OF ENGINEERING

Because design is the heart of engineering, design is integrated throughout the programs, starting with ECE 101, Introduction to ECE, and moving on to circuits and laboratory courses, ECE 203, ECE 213, and ECE 206L. Design continues in computer-related courses, ECE 238L and ECE 344L, in electronics, and in other courses throughout the program. The design process culminates with a capstone Senior Design sequence that includes ECE 419 and ECE 420. The goals of this design experience are to provide a team-based project experience that enables students to apply the fundamentals of electrical and computer engineering to identifying, formulating and solving engineering problems related to a significant and realistic project.

ABOUT THE COMPUTER AND ELECTRICAL ENGINEERING FIELDS

Both computer and electrical engineering have been and continue to be dynamic fields that provide exciting and excellent career opportunities. Computer engineers and electrical engineers use mathematics, physics, and other sciences together with computers, electronic instrumentation, and other tools to create a range of systems including integrated circuits, telecommunication networks, wireless personal communication systems, diagnostic medical equipment, robotic probes, radar systems, electrical power distribution networks, hardware and software systems, operating systems, computer organization and data structures, and computer networks.

These fields have changed the way we live and work. The continuous need to improve and discover new systems makes computer and electrical engineering professionals more sought after than ever before. The Bachelor of Science programs in computer engineering and electrical engineering in ECE at UNM provide students with the skills necessary to compete in such a rapidly changing discipline.

BACCALAUREATE DEGREE PROGRAM

CAREER OPPORTUNITIES

The present demand for computer and electrical engineers is strong and the employment rate for UNM graduates has been high. Demand is expected to remain strong, with continued expansion especially in the areas of microelectronics, optoelectronics, communications, bio-engineering, and computers and digital systems. Both computer and electrical engineers are employed by large corporations as well as by small companies, in various governmental agencies and laboratories, by universities and research institutes, and as private consultants. The career work is varied and includes research, product design and development, production, sales, and management. It also provides opportunities for interaction with other engineering disciplines and people working in sciences such as chemistry, physics, and mathematics.

STUDENT RESPONSIBILITY

UNDERSTANDING REQUIREMENTS AND REGULATIONS

Students are responsible for making sure that they understand and fulfill all applicable requirements for their degree and that they comply with all UNM regulations. This information can be found in the UNM Catalog. Students have the option of completing degree requirements listed in the issue of the catalog in use during the term they were admitted to ECE or any issue thereafter. Catalogs are available online at: <http://registrar.unm.edu/UNM%20Catalog/>.

Entering students should especially read the sections of the UNM Catalog that pertain to:

- UNM's general academic regulations
- The School of Engineering; and
- The Electrical & Computer Engineering Department, including course descriptions, required prerequisites and co-requisites

This Undergraduate Handbook outlines the curricula for the degree programs offered in the Electrical & Computer Engineering Department. Students are encouraged to examine the information in this handbook carefully and to consult with ECE's undergraduate academic advisor if any questions arise.

GETTING ADMITTED

ADMISSION TO THE SCHOOL OF ENGINEERING

High school students intending to pursue a degree in electrical or computer engineering at UNM are encouraged to take four full years of high school English, mathematics, and science. High school chemistry and physics are important for engineering, and high school math should include at least two years of algebra, one year of geometry and one year of pre-calculus. High school courses in calculus and computer programming are recommended, and students are encouraged to take enriched, honors, or AP classes in math and the sciences.

Freshmen admitted to UNM who declare engineering as a major and who meet all three of the following criteria are eligible for enrollment in the School of Engineering in a pre-major status: *1) ACT Math score 25 or higher; 2) ACT English and Science scores 19 or higher; and 3) ACT Reading score 18 or higher.* These students' academic records will be maintained by the school's Engineering Student Services (ESS) office. These requirements, as well as admission requirements for students who do not initially meet these criteria or who wish to transfer to the school, are outlined in the UNM Catalog.

Because each student's situation is unique, academic advising is mandatory each semester for all students in the School of Engineering. Students may not register for classes in any semester until after being advised. Students in their first year of pre-major status are advised in the ESS office. More advanced pre-major students and students admitted to ECE are advised by ECE's undergraduate academic advisor. Once a student is admitted to the ECE Department, their academic records are maintained by ECE.

ADMISSION TO AN ECE PROGRAM

In order for a student to be eligible to apply to the ECE program, they must first be admitted to UNM and the School of Engineering. They must also complete approximately one year of the appropriate freshman-year subjects. Applicants should consult with ECE's undergraduate academic advisor for evaluation of academic work prior to submitting application. All applications must be approved by ECE prior to admission.

There are three minimum requirements for admission to undergraduate study in the Electrical Engineering or Computer Engineering program.

1. Completion of at least 26 semester hours applicable to the degree, with a minimum GPA of 2.20 out of a possible 4.3 and a minimum grade of C for every course. If more than 26 hours applicable to the degree have been completed, the minimum GPA of 2.20 also applies to those hours.
2. Completion of at least 18 semester hours of freshman-year technical subjects, with a minimum GPA of at least 2.50 and a minimum grade of C for every course. Courses must include Math 162 and Math 163.

Additional hours of prerequisite course work must be chosen from ECE 101, ECE 131, Physics 160, 161/161L, and:

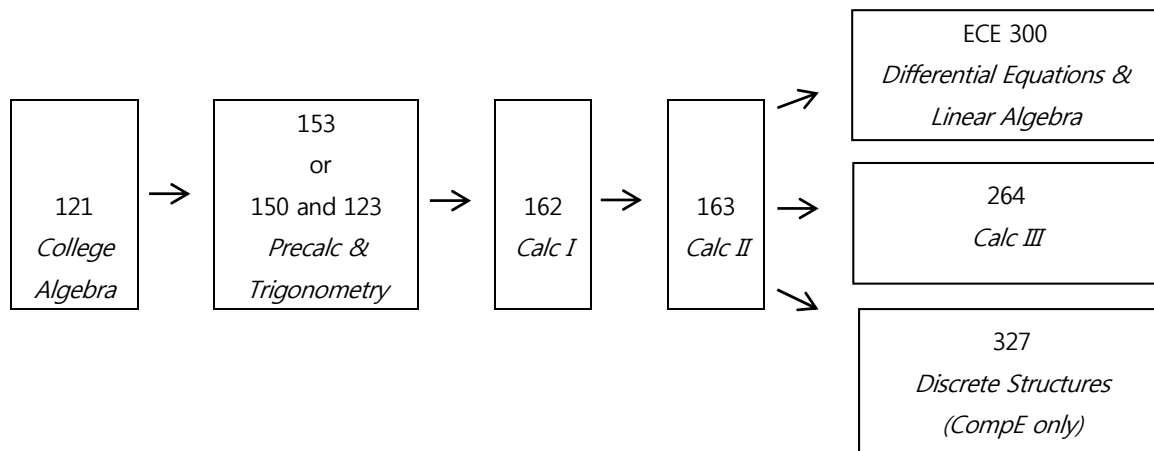
- For the Electrical Engineering Program: approved basic science, physics, math 300-level or above
 - For the Computer Engineering Program: ECE 203, ECE 231, approved basic science, physics
3. Completion of English 110 or its equivalent with a minimum grade of C.

GETTING ADMITTED

MATHEMATICS PLACEMENT AND PREREQUISITES

The lowest-level math course in the ECE curriculum is Math 162. Prerequisite courses must be satisfied with a grade of C or better in accordance with UNM's core curriculum. Placement in mathematics courses is determined by the student's ACT and SAT quantitative scores. In general, to enroll in Math 162 (Calculus I) the student must have an ACT math score of 28 or greater or an SAT quantitative score of 640 or greater. If the student has not yet completed Math 123 (trigonometry), which is a prerequisite for Math 162, he/she must pass the COMPASS trigonometry exam offered at the UNM Testing Center or successfully complete Math 123 prior to enrolling in Math 162.

ENGINEERING MATHEMATICS SEQUENCE



ENG 120 – MATHEMATICS FOR ENGINEERING APPLICATIONS

Students who are required to begin the math sequence at or below the precalculus level, should also consider enrolling in ENG 120. This course was designed to allow students to move forward in the ECE curriculum sequence while completing the remaining calculus requirements. Normally, students would be required to complete Calculus II before advancing in the curriculum which could delay graduation. Students should discuss this option with the ECE Academic Advisor.

NAVIGATING YOUR DEGREE

ACADEMIC ADVISING

Students admitted to ECE will be required to attend formal advising sessions twice a year to address questions or problems that may arise and to ensure that they are on track for graduation. These advisement sessions occur in November and April just prior to registration. Advisement holds are placed on a student's record each semester and are not removed until the student has met with their advisor. Students are initially advised by the ECE Academic Advisor and then are assigned to a Faculty Advisor once they have selected a track.

STUDENTS RESPONSIBLE FOR READING EMAIL

Students are expected to read and respond to UNM, SOE and ECE related email and will be fully responsible if these messages are neglected and important notices and deadlines contained in these messages are missed (including messages related to applications, scholarships, internships, tuition payments and registration).

OTHER OPTIONS FOR EARNING COURSE CREDIT

Credit may be granted to students who earn certain scores on ACT, SAT, or CLEP exams or who transfer credits from other institutions. Please see "Alternative Credit Options" in the UNM Catalog and consult with ECE's undergraduate academic advisor about details and options for earning course credit.

CHALLENGE EXAMS

Challenge examinations may be administered to students who wish to establish credit for courses required in the Electrical Engineering or Computer Engineering program. This process is subject to restrictions described in the UNM Catalog. A student may not challenge a course that he/she has taken previously at UNM, including courses with W, WP and WF grades. A course can be challenged only once. For students who were exposed to nontransferable similar material at another institution, the amount of effort required to review for a challenge examination is a major consideration. Frequently, the effort required to review for a challenge examination may be comparable to that required for taking the course. The procedure for challenging a course is:

1. An Electrical Engineering or Computer Engineering professor reviews a student's background and recommends a course challenge to the Undergraduate Program associate chair.
2. The associate chair reviews the recommendation of the professor and suggests an appropriate professor to administer the challenge examination.
3. The student obtains the necessary UNM form from the School of Engineering Dean's Office and pays the appropriate fees for the course challenge. The authorization form is then signed by the associate chair and by the associate dean of the School of Engineering.
4. The student takes the challenge examination and receives a credit or no-credit grade from the examiner.
5. The professor sends the form to the UNM Records & Registration Office (Office of the Registrar in Enrollment Management) to be recorded officially on the student's transcript.

NAVIGATING YOUR DEGREE

There is no fixed format for a challenge exam. For a lecture course, a challenge may require that a student take a special comprehensive final examination. Alternatively, for example, the examiner may require that the student take the periodic examinations of a section of her/his course during an academic session and then take the final examination. The intent of the challenge is to determine whether the student knows the course material and whether the student's knowledge and experience is equivalent in all respects to the course content as described in the UNM Catalog and as reported to ABET. Challenges of laboratory courses must demonstrate proficiency in oral and written communication, in related theory, and in laboratory practice, and must satisfy any design requirements.

GRADUATING WITH DEPARTMENTAL, BACCALAUREATE AND UNIVERSITY HONORS

Students may be recognized for academic excellence by graduating with Departmental Honors, Baccalaureate Honors, University Honors, or a combination of the three.

See the UNM Catalog for further information related to Baccalaureate and University Honors and the ECE Academic Advisor for details about Departmental Honors.

SCHOLARSHIPS

UNM's School of Engineering has a number of scholarships that it awards to engineering students. Students apply for scholarships in the spring semester, and the scholarships are awarded for the next academic year and run for the full year. Some scholarships are designated for specific degree programs, such as Electrical Engineering or Computer Engineering, or for minorities, women, and others. An effort is made to distribute undesignated scholarships as widely as possible, so some awards are small.

Application forms are made available each year in early spring on the School of Engineering website at www.soe.unm.edu. For additional information, students may contact the Engineering Scholarships Program Manager located in the Centennial Engineering Center, Room 2080.

EIGHT-HOUR RULE

With the exception of ECE 300, students do not enroll for 300-level courses and above unless they are within eight hours of completing their first- and second-year requirements and they are enrolled for the remaining first- and second-year courses.

CREDIT/NO-CREDIT OPTION

An Electrical Engineering or Computer Engineering student may choose a maximum of nine (9) credit/no-credit hours from the humanities, social science, fine arts, and second language elective categories. All other courses in the ECE program must be taken for a grade.

NAVIGATING YOUR DEGREE

GRADES OF C-, D OR F, AND REPLACING GRADES

Beginning in spring 2005, grades of C- or lower are not accepted by ECE. In addition, the School of Engineering prohibits granting a Bachelor of Science degree in any branch of engineering if thirty (30) or more semester hours applicable to a degree program have grades of D, F, WF or NC.

Students are allowed to replace twelve (12) hours of repeated course work. This action is not automatic. Students must initiate the process by completing a form online or at the Registrar's Office.

THREE-ATTEMPTS RULE

Students admitted to the Electrical & Computer Engineering Department during or after the fall 2003 semester must complete all coursework required for graduation in a School of Engineering degree program within three (3) attempts. This includes courses offered by other departments at UNM, such as mathematics and physics. An attempt includes receiving any letter grade (A through F), WP, WF, W, WNC, CR, NC, I, or Audit. For purposes of this requirement, coursework taken at other institutions is treated the same as UNM coursework.

PROBATION, DISMISSAL OR SUSPENSION

School of Engineering (SOE) students will be placed on probation under any of the following conditions:

1. For pre-major students, when the cumulative grade point average based on work taken at the University of New Mexico and accepted toward a particular School of Engineering degree falls below 2.50 or below 2.00 in the most recent semester.
2. For students already admitted to an SOE degree program, when the cumulative grade point average based on work taken at UNM and accepted toward a particular SOE degree falls below 2.00 or below 1.50 in the most recent semester.
3. When there is unsatisfactory progress towards a School of Engineering degree.
4. Upon admission to the University of New Mexico and SOE as a transfer student with a poor academic record at other schools.
5. When a student is placed on UNM academic probation.

Students on probation are subject to suspension from UNM or dismissal from the School of Engineering if their UNM GPA is below a 2.0. See the UNM Catalog for the pertinent regulations.

ECE students may be placed on probation for noncompliance with academic regulations – such as the Eight-Hour Rule (see above) and prerequisite requirements – and in general taking courses that are not contributing to progress toward obtaining their degree. Repeated violations will result in dismissal from the department.

NAVIGATING YOUR DEGREE

RETURNING TO THE DEPARTMENT AFTER DISMISSAL

Readmission to the ECE Department after dismissal from the School of Engineering is not automatic. Students wishing to return must meet with the ECE Academic Advisor to complete an admission plan which would outline the steps required to regain admission to the program. The plan would include a list of courses to be completed, a specific time frame in which to complete them, and the minimum grades required for each course. Students who do not successfully complete the admission plan will not be readmitted to SOE and will not be allowed to take courses offered by SOE.

MINOR STUDIES

Since spring 1995, the School of Engineering permits undergraduates to complete and receive recognition for study in a minor. Students wishing to complete a minor:

1. Must meet the combined program requirements of their major and the minor at the time of graduation;
2. Are subject to all current UNM core curriculum requirements; and
3. Are not permitted to count any courses specifically required by the major degree toward the minor.

Students desiring to pursue a minor should see their academic advisor. Students should be aware that pursuing a minor may extend the time of graduation.

SENIORS PLANNING FOR GRADUATE STUDY

The Electrical & Computer Engineering Department offers programs of study toward the Master of Science and Doctorate of Philosophy degrees. Consult the graduate programs sections of the UNM Catalog and contact the ECE Department's graduate coordinator for detailed information.

Senior students with a GPA of 3.0 or greater who are within 10 semester hours of completing the baccalaureate degree may obtain graduate credit for a maximum of nine semester hours, provided that they meet the requirements specified in the graduate sections of the UNM Catalog. Students may receive graduate credit only for 400-level ECE courses marked by an asterisk (*). Non degree students taking 400-level courses must obtain permission from the course instructor to obtain graduate credit.

THE SHARED CREDIT PROGRAM

The School of Engineering offers a Shared Credit Degrees Program designed to allow students to complete both BS and MS degrees in less time. To accomplish this, students would be allowed to take graduate level ECE courses during their senior year. Credits for these courses would be shared between both the BS and MS

NAVIGATING YOUR DEGREE

programs. The Computer Engineering (CompE) program allows up to 12 credit hours to be shared. The Electrical Engineering (EE) program allows up to 9 credit hours to be shared.

Applications for this program can be obtained from the ECE Academic Advisor and must be submitted during a student's junior year. Students will also be required to submit an application to the graduate program during their senior year. Admission to the graduate portion of this program is provisional, and is not finalized until the student satisfactorily completes the requirements for the BS degree. The online application to the graduate program can be found at: <http://www.unm.edu/apply/>.

Please see the ECE Undergraduate Academic Advisor for further details about this program.

THE 3+2 BS/MBA PROGRAM

In cooperation with the Anderson School of Management (ASM), ECE offers the 3+2 Program allowing students to complete both their BS and MBA degrees in five (5) years. This program is suited for engineers who wish to pursue a management role in a high-technology business, start their own company or join an entrepreneurial team.

For the first three years of undergraduate study, students would pursue the normal engineering curriculum sequence. During the senior year, students would begin the MBA program while completing the requirements for the BS degree. Some courses would count toward both programs. In the fifth year of study, the remaining requirements of the MBA program would be completed.

Students are required to apply to the MBA program at ASM during the second semester of their junior year. Students are expected to meet regular MBA admission requirements with a minimum GPA of 3.0 and minimum GMAT score of 500 or equivalent score on the GRE.

Students should not take any management classes prior to their acceptance into the program, with the exception of MGMT 113 (Introduction to Management).

Application and additional details about this program can be found on the ASM website at: <https://bba.mgt.unm.edu/coursework/3-2-program-info.asp>

APPLICATION FOR DEGREE

During the second semester of a student's junior year, or prior to enrollment in the 100th credit hour for the degree, a student is required to file the "Application for an Undergraduate Degree" with the Undergraduate Academic Advisor. This form is available online on the "Undergraduate" page of the ECE website at ece.unm.edu. Failure to complete this form may delay graduation.

NAVIGATING YOUR DEGREE

ALUMNI CONNECTIONS

All ECE students are given the opportunity to assess the department, including but not limited to an exit survey. ECE is committed to maintaining a lifelong relationship with its graduates and always welcomes feedback during all phases of students' academic and post-academic careers. The department continually expands the means for maintaining this connection, including traditional correspondence as well as online social media.

ECE faculty and staff do whatever they can to help students and alumni, and they appreciate alumni doing the same by offering feedback and insights. By helping ECE become a better department, alumni also increase the value and prestige of the degree that they earned from ECE.

UNDERGRADUATE DEGREE PROGRAM

The undergraduate degrees offered by UNM's ECE Department are the Bachelor of Science degree in Electrical Engineering (EE) and the Bachelor of Science degree in Computer Engineering (CompE).

This handbook describes the ECE curriculum for students who entered the program during or after the spring 2015 term. Students who are following an earlier catalog year may find their curriculum sequence in the University Catalog dated for that term.

Students are encouraged to follow the curriculum sequence as closely as possible to ensure that:

- Prerequisite courses are completed in a timely manner, preparing students to be successful in each of the courses that follow;
- Courses are available when needed, as some courses are only offered once a year;
- Students complete their bachelor's degree in the most efficient time possible.

Students who do not follow the sequence may be unsuccessful in some courses which could extend the time needed to graduate.

ECE strictly enforces prerequisites. Under extenuating circumstances, however, instructors may choose to override these. Students will assume full responsibility for their performance in these situations.

UNM CORE CURRICULUM FOR ECE

UNM CORE CURRICULUM/CORE ELECTIVES FOR ECE STUDENTS

UNM adopted a core curriculum in fall 2003 which all undergraduate students must complete as part of their baccalaureate program. See UNM Catalog for details.

UNM core requirements for *Writing and Speaking*, *Mathematics*, and *Physical and Natural Sciences* have already been incorporated into the ECE curriculum sequences.

ECE students may choose from the following electives for the *Social and Behavioral Sciences*, *Humanities*, *Fine Arts* and *Foreign Language* requirements.

CORE ELECTIVES FOR ECE STUDENTS

effective in or after fall 1999

SOCIAL AND BEHAVIORAL SCIENCES

- Economics 105 or 106

One course chosen from among the following:

- American Studies 182 or 185
- Anthropology 101 or 130
- Economics 105 or 106
- Geography 102
- Linguistics 101
- Political Science 110 or 200
- Psychology 105
- Sociology 101
- ENG 200 - Technology in Society

HUMANITIES

Two courses chosen from among the following:

- American Studies 186
- Classics 107, 204, or 205
- Comparative Literature and Cultural Studies 223 or 224
- English 150, 292, or 293
- Foreign Languages (M Lang) 101
- History 101, 102, 161, or 162
- Philosophy 101, 201, or 202
- Religious Studies 107

SECOND LANGUAGE

One course chosen from any of the lower division non-English-language offerings of the departments of Linguistics, Spanish & Portuguese, and Foreign Languages & Literature. Students with knowledge of a second language equivalent to four semesters of study are deemed to have satisfied this requirement. CLEP and AP credits can be used for placement, but unless the student has demonstrated knowledge equivalent to four semesters of study, an additional semester of a second language must be taken.

FINE ARTS

One course chosen from among the following:

- Art History 101, 201, or 202
- Dance 105
- Media Arts 210
- Music 139 or 140
- Theater 122

Students may instead elect to take one three-credit studio course in the departments of Art & Art History, Music, Theater & Dance, or Media Arts to fulfill this requirement.

TRACK COURSES & TECHNICAL ELECTIVES

ECE TRACK COURSES AND TECHNICAL ELECTIVES

Both the Computer Engineering and Electrical Engineering programs offer areas of specialization, or tracks. Students must take two classes from the track of their choice. In addition, technical electives are required by both programs. Technical electives are developed in consultation with your academic advisor and can be taken from ECE, Computer Science, Physics, Math or other engineering-related courses 300-level or above. (*ECE 231: Intermediate Programming is the only 200-level exception allowed in the EE program only.*) Below is a list of track areas, courses required for each and technical elective credit hours required for by each program.

ECE Technical Electives

Technical Electives are approved 300-level and above courses developed in consultation with a student's academic advisor. These can be taken from ECE, Computer Science, Math, Physics, or other engineering-related courses. ECE 231 - Intermediate Programming is the only 200-level exception allowed for the EE program only.

Computer Engineering: 6 credits required
Electrical Engineering: 3 credits required

TRACK COURSES & TECHNICAL ELECTIVES

ECE Track Courses

COMPUTER ENGINEERING OPTIONS

- **Hardware Emphasis**
 - ECE 338 – Intermediate Logic Design *Prerequisite(s): 238L*
 - ECE 438 – Design of Computers *Prerequisite(s): 338, 344L*
- **Software Emphasis**
 - ECE 335 – Integrated Software Systems *Prerequisite(s): 330*
 - ECE 435 – Software Engineering *Prerequisite(s): 331, 335*

ELECTRICAL ENGINEERING OPTIONS

- **Systems and Controls:**
 - ME 481/581 – Digital Control of Mechanical Systems *Prerequisite(s): ME 380*
 - ECE 446 – Design of Feedback Control Systems *Prerequisite(s): ECE 345*
- **Energy/Power Systems:**
 - ECE 482/582 – Electric Drives and Transformers *Prerequisite(s): 213*
 - ECE 483/583 – Power Electronics *Prerequisite(s): 321L, 371, 381*
 - ECE 484/584 – Photovoltaics *Prerequisite(s): 381*
 - ECE 488/588 – Smart Grid Technologies *Prerequisite(s): 482, 483, 484*
- **Signals and Communications:**
 - ECE 439 – Intro to Digital Signal Processing *Prerequisite(s): 314*
 - ECE 442 – Intro to Wireless Communications *Prerequisite(s): 314, 360*
- **Microelectronics:**
 - ECE 471– Materials and Devices II *Prerequisite(s): 360, 371*
 - ECE 474L/574L/NSMS 574L – Microelectronics Proc *Prerequisite(s): 371*
 - OR
 - ECE 421/523 – Analog Electronics *Prerequisite(s): 322L*
 - ECE 424 – Digital VLSI Design *Prerequisite(s): 321L, 338*
- **Electromagnetics:**
 - ECE 460/560 – Intro to Microwave Engineering *PR: 360*
 - ECE 469/569 – Antennas for Wireless Com Sys *PR: 360*
 - ECE 495 – Computational Methods for Electromagnetics
 - ECE 495 – Plasma Physics I
- **Digital Systems:**
 - ECE 338 – Intermediate Logic Design *PR 238L*
 - ECE 438 – Design of Computers *PR: 338, 344L*
 - OR
 - ECE 231 – Intermediate Programming and Eng Prob Solving *PR: 131*
 - ECE 331 – Data Structures and Algorithms *PR: 231, MATH 327*
- **OptoElectronics:**
 - ECE 471– Materials and Devices II *PR: 360, 371*
 - ECE 475 – Intro to Electro-Optics and Opto-Electronics *PR: 371*

BS COMPUTER ENGINEERING

BS Computer Engineering Graduation Requirements Effective Spring 2015

Total credit hours: 120; All grades must be C or better in the Computer Engineering Program
For more information, see the ECE Undergraduate Handbook at www.ece.unm.edu

General Education Component

Written Communication (9 credits)

ENGL 110♦ Accelerated Composition (3)
(or ENGL 112 Composition II;
or ENGL 113 Enhanced Composition)
ENGL 120 Composition III (3)
Engl 219 Technical Writing (3)

Area of Knowledge (18 credits)

Core Social/Behavioral Science Elect. (3)
Econ 105 or 106 (Social & Beh. Science) (3)
Core Humanities Elective (6)
Core Fine Arts Elective (3)
Core Second-Language Elective (3)

Mathematics & Sciences Component

Mathematics (19 credits)

Math 162♦, 163♦, 264 Calculus I, II, III (12)
Math 327 Discrete Structures (3)
ECE 300 Advanced Engineering Mathematics (4)

Science (11 credits)

Phys 160*, 161*, 161L*, General Physics (7)
Additional approved basic sciences:* (4)
(Biol 110 w/112L, 123 w/124L, 201L, 202L; Chem 121w/
123L; Phys 262 w/262L; or Astr 270 w/270L, 271 w/271L)

Computer Engineering Component

Required (51 credits)

ECE 101 Introduction to ECE (1)*
ECE 131 Programming Fundamentals (3)*
ECE 203 Circuit Analysis I (3)*
ECE 206L Instrumentation (2)
ECE 213 Circuit Analysis II (3)
ECE 231 Intermediate Programming (3)*
ECE 238L Computer Logic Design (4)
ECE 314 Signals & Systems (3)
ECE 321L Electronics I (4)
ECE 330 Software Design (3)
ECE 331 Data Structures & Algorithms (3)
ECE 340 Probabilistic Methods (3)
ECE 344L Microprocessors (4)
ECE 419 Senior Design I (3)
ECE 420 Senior Design II (3)
ECE 437 Operating Systems (3)
ECE 440 Computer Networks (3)

Track Courses (6 credits)

Hardware Emphasis

ECE 338 Intermediate Logic Design (3)
ECE 438 Design of Computers (3)

--or--

Software Emphasis

ECE 335 Integrated Software Systems (3)
ECE 435 Software Engineering (3)

Technical Electives (6 credits)

ECE Technical Elective (6)
Approved 300-level and above courses developed in
consultation with your faculty advisor

.....
Eighteen hours of prerequisite technical courses must be completed prior to applying to the department.

A GPA of 2.5 or better on prerequisite coursework is required for admission to the department. A student's overall GPA must not fall below 2.20

♦ Denotes required prerequisites that must be completed prior to applying for admission to ECE.

* Ten additional hours of prerequisite course work must be chosen from these courses.

Updated March 9, 2016

BS COMPUTER ENGINEERING

BS Computer Engineering Curriculum

Effective Spring 2015 (120 hours)

FRESHMAN YEAR					
FALL SEMESTER			SPRING SEMESTER		
Course #	core	Cr	Course #	core	Cr
ECE 101: Intro to ECE		1	ECE 231: Intermediate Programming		3
ECE 131: Programming Fundamentals		3	MATH 163: Calculus II		4
ENGL 110: Accelerated Composition (or ENGL 112: Composition II or ENGL 113: Enhanced Composition)	WS	3	ENGL 120: Composition III	WS	3
MATH 162: Calculus I	MTH	4	PHYC161: General Physics	PNS	3
PHYC 160: General Physics	PNS	3	PHYC161L: General Physics Lab	PNS	1
Total		14	Total		14
SOPHOMORE YEAR					
FALL SEMESTER			SPRING SEMESTER		
Course #	core	Cr	Course #	core	Cr
ECE 203: Circuit Analysis I		3	ECE 206L: Instrumentation		2
ECE 238L: Computer Logic Design		4	ECE 213: Circuit Analysis II		3
Basic Science with Laboratory		4	ECE 300: Advanced Eng. Mathematics		4
ECON 105 or 106: Macro/Microeconomics	SB	3	ECE 330: Software Design <i>Spring Only</i>		3
ENGL 219: Technical Writing	WS	3	MATH 264: Calculus III		4
Total		17	Total		16
JUNIOR YEAR					
FALL SEMESTER			SPRING SEMESTER		
Course #	core	Cr	Course #	core	Cr
ECE 314: Signals and Systems		3	ECE 331: Data Structure Alg. <i>Spring Only</i>		3
ECE 321L: Electronics I <i>Fall Only</i>		4	ECE 344L: Microprocessors		4
ECE 340: Probabilistic Methods		3	Technical Elective***		3
MATH 327: Discrete Structures		3			
Foreign Language Core*	*FL	3	Social/Behavioral Sciences Core Elective*	*SB	3
Total		16	Total		13
SENIOR YEAR					
FALL SEMESTER			SPRING SEMESTER		
Course #	core	Cr	Course #	core	Cr
ECE 419: Senior Design I <i>Fall Only</i>		3	ECE 420: Senior Design II <i>Spring Only</i>		3
ECE 437: Operating Systems		3	ECE 440: Comp. Networks		3
ECE Track Course**		3	ECE Track Course**		3
Technical Elective***		3	Fine Arts Core Elective*	*HU	3
Humanities Core Elective*	*HU	3	Humanities Core Elective*	*FA	3
Total		15	Total		15

*See approved list of core electives in the ECE Undergraduate Handbook.

**ECE track courses for Computer Engineering consist of ECE 338 and 438, or ECE 335 and 435

***Technical electives are developed in consultation with your academic advisor and can be taken from ECE, Computer Science, Physics, Math or other engineering-related courses 300-level or above.

No grades below a 'C' are allowed in the Computer Engineering Program.

Updated March 9, 2016

BS ELECTRICAL ENGINEERING

BS Electrical Engineering Graduation Requirements Effective Spring 2015

Total credit hours: 120; All grades must be C or better in the Electrical Engineering Program
For more information, see the ECE Undergraduate Handbook at www.ece.unm.edu

General Education Component

Written Communication (9 credit)

ENGL 110♦ Accelerated Composition (3)
(or ENGL 112 Composition II;
or ENGL 113 Enhanced Composition)
ENGL 120 Composition III (3)
Engl 219 Technical Writing (3)

Area of Knowledge (18 credits)

Core Social/Behavioral Science Elect. (3)
Econ 105 or 106 (Social & Beh. Science) (3)
Core Humanities Elective (6)
Core Fine Arts Elective (3)
Core Second-Language Elective (3)

Mathematics & Sciences Component

Mathematics (16 credits)

Math 162♦, 163♦, 264 Calculus I, II, III (12)
ECE 300- Advanced Engineering Mathematics (4)

Science (13 credits)

Phys 160* 161* 161L*, 262* General Physics (10)
Basic Science or Mathematics* 300 level and above (3)
(Chem 121 or 122, Bio 110 or 123 or 202, Astr 270 or 271)

Electrical Engineering Component

Required (36 credits)

ECE 101 Introduction to ECE (1)*
ECE 131 Programming Fundamentals (3)*
ECE 203 Circuit Analysis I (3)*
ECE 206L Instrumentation (2)
ECE 213 Circuit Analysis II (3)
ECE 238L Computer Logic Design (4)
ECE 314 Signals & Systems (3)
ECE 321L Electronics I (4)
ECE 340 Probabilistic Methods (3)
ECE 344L Microprocessors (4)
ECE 419 Senior Design I (3)
ECE 420 Senior Design II (3)

EE Completeness (19 credits)

ECE 322L Electronics II (4)
ECE 341 Intro to Communication Systems (3)
ECE 345 Intro to Control Systems (3)
ECE 360 Electromagnetic Fields & Waves (3)
ECE 371 Materials & Devices (3)
ECE 381 Intro to Power Systems (3)

Track Courses (6 credits - depth)

Two courses from one of the following available tracks (6):
- Digital Systems
- Electromagnetics
- Microelectronics
- Optoelectronics
- Power/Energy Systems
- Signals and Communications
- Systems and Controls

Technical Elective (3 credits - breadth)

ECE Technical Elective (3)
Approved 300-level and above course developed in
consultation with your faculty advisor
May include ECE 231 Intermediate Programming (3)

.....
Eighteen hours of prerequisite technical courses must be completed prior to applying to the department.

A GPA of 2.5 or better on prerequisite coursework is required for admission to the department. A student's overall GPA must not fall below 2.20

♦ Denotes required prerequisites that must be completed prior to applying for admission to ECE.

* Ten additional hours of prerequisite course work must be chosen from these courses.

Updated March 9, 2016

BS ELECTRICAL ENGINEERING

BS Electrical Engineering Curriculum

Effective **Spring 2015** (120 hours)

FRESHMAN-FIRST YEAR					
FALL SEMESTER			SPRING SEMESTER		
Course #	core	CR	Course #	core	CR
ECE 101: Intro to ECE		1	MATH 163: Calculus II		4
ECE 131: Programming Fundamentals		3	ECON 105 or 106* Macro/Microeconomics	SB	3
ENGL 110: Accelerated Composition (or ENGL 112: Composition II or ENGL 113: Enhanced Composition) (or ENGL 114: Technical Writing)	WS	3	ENGL 120: Composition III	WS	3
MATH 162: Calculus I	MTH	4	PHYC 161: General Physics II	PNS	3
PHYC 160: General Physics I	PNS	3	PHYC 161L: General Physics II Lab	PNS	1
		14			14
SOPHOMORE-SECOND YEAR					
FALL SEMESTER			SPRING SEMESTER		
Course #	core	CR	Course #	core	CR
ECE 203: Circuit Analysis I		3	ECE 206L: Instrumentation		2
ECE 238L: Comp. Logic Design		4	ECE 213: Circuit Analysis II		3
MATH 264: Calculus III		4	ECE 300: Advanced Eng. Mathematics		4
PHYC 262: General Physics III		3	Basic Science or Math Elective		3
ENGL 219: Technical Writing	WS	3	Humanities*	HU	3
		17			15
JUNIOR-THIRD YEAR					
FALL SEMESTER			SPRING SEMESTER		
Course #	core	CR	Course #	core	CR
ECE 314: Signals and Systems		3	ECE 322L (ECE Completeness Course) <i>Spring Only</i>		4
ECE 321L: Electronics I <i>Fall Only</i>		4	ECE 344L: Microprocessors		4
ECE 340: Probabilistic Methods		3	ECE 360 (ECE Completeness Course) <i>Spring Only</i>		3
ECE 371 (ECE Completeness Course) <i>Fall Only</i>		3	ECE 381 (ECE Completeness Course) <i>Spring Only</i>		3
Social/Behavioral Science*	SB	3	Humanities*	HU	3
		16			17
SENIOR -FOURTH YEAR					
FALL SEMESTER			SPRING SEMESTER		
Course #	core	CR	Course #	core	CR
ECE 341 (ECE Completeness Course) <i>Fall Only</i>		3	ECE 420: Senior Design II <i>Spring Only</i>		3
ECE 345 (ECE Completeness Course) <i>Fall Only</i>		3	ECE Track Course**		3
ECE 419: Senior Design I <i>Fall Only</i>		3	Technical Elective***		3
ECE Track Course**		3			
Fine Arts*	FA	3	Foreign Language*	FL	3
		15			12

*See approved list of core electives in the ECE Undergraduate Handbook.

**ECE track courses for Electrical Engineering must be from a listed track.

***Technical elective is developed in consultation with your academic advisor and can be taken from ECE, Computer Science, Physics, Math or other engineering-related courses 300-level or above. (ECE 231: Intermediate Programming is the only 200-level exception)

No grades below a 'C' are allowed in the Electrical Engineering Program.

ECE UNDERGRADUATE COURSE LIST

CRS #	CROSSLIST	COURSE TITLE	CR	Offered (F)all (S)pring	PRE-REQS	PRE or CO-REQS
101		Intro to Electrical and Computer Engineering	1	F S		
131		Programming Fundamentals	3	F S	Recommend MATH 121 or above	
203		Circuit Analysis I	3	F S	MATH 163 or ENG 120	PHYC 161
206L		Instrumentation	2	F S	ENGL 120	ECE 203
213		Circuit Analysis II	3	F S	ECE 203	ECE 300 or MATH 314 and 316
231		<i>Intermediate Progrmg and Eng Prob Solving</i>	3	F S	ECE 131	
238L		Computer Logic Design	4	F S	ECE 131	
300		Adv Eng Mathematics	4	F S	MATH 163	
314		Signals and Systems	3	F S	ECE 213, MATH 264	
321L		Electronics I	4	F	ECE 213	
322L		Electronics II	4	S	ECE 321L	
330		Software Design	3	S	ECE 231	
331		Data Structures and Algorithms	3	S	ECE 231, MATH 327	ECE 340
335		Integrated Software Systems	3	F	ECE 330	
338		Intermediate Logic Design	3	F	ECE 238L	
340		Probabilistic Methods in Engineering	3	F S	MATH 314 or ECE 300	ECE 314
341		Introduction to Communication Systems	3	F	ECE 314, ECE 340	
344L		Microprocessors	4	F S	ECE 206L, 238L, 321L	
345	ME 380	Introduction to Control Systems	3	FS	ECE 314	
360		Electromagnetic Fields and Waves.	3	S	ECE 213, PHYC 161, MATH 264	
371		Materials and Devices	3	F	PHYC 262	
381	595	Introduction to Electric Power Systems	3	S	ECE 213	
412	CS 412	Intro to Computer Graphics	3	F	ECE 331 or CS 361	
419		Senior Design I	3	F	Senior Standing	
420		Senior Design II	3	S	ECE 419	
421	523	Analog Electronics	3	F	ECE 322L	
424	520	Digital VLSI Design	3	S	ECE 321L, 338	
432	CS 442	Introduction to Parallel Processing	3	S	ECE 331 or CS 351L and CS 341L	
435		Software Engineering.	3	S	ECE 331	ECE 335
437	CS 481	Computer Operating Systems	3	F S	ECE 330 or CS 341L	
438		Design of Computers	3	S	ECE 338, 344L	
439		Introduction to Digital Signal Processing	3	F	ECE 314	
440	CS 485/585	Introduction to Computer Networks	3	F S	ECE 330	

Pre/co-requisite changes in progress. Overrides may be needed. See undergraduate academic advisor for assistance.

ECE UNDERGRADUATE COURSE LIST

CRS #	CROSSLIST	COURSE TITLE	CR	Offered (F)all (S)pring	PRE-REQS	PRE or CO-REQS
442	595	Introduction to Wireless Communications	3	S	ECE 314, 360	
443		Hardware Design with VHDL	3	F	ECE 338	
446		Design of Feedback Control Systems	3	S	ECE 345	
460	560	Introduction to Microwave Engineering	3	F	ECE 360	
463	PHYC 463	Advanced Optics I	3	F	PHYC 302	
464	PHYC 464	Laser Physics	3	F	ECE 360 or PHYC 406	
469	569	Antennas for Wireless Com Sys	3	S	ECE 360	
471		Materials and Devices II	3	F	ECE 360, 371	
474L	574L ME 461/561	Microelectronics Processing	3	F	ECE 371	
475		Intro to Electro-Optics and Opto-Electronics	3	S	ECE 371	
482	582	Electric Drives and Transformers	3	S	ECE 213	
483	583	Power Electronics	3	F	ECE 321L, 371, 381	
484	584	Photovoltaics	3	S	ECE 381	
488	588	Future Energy Systems	3	F	ECE 482, 483, 484	